

AGRICULTURAL RESEARCH
NATIONAL PROGRAM STAFF
BELTSVILLE, MARYLAND 20705

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February 28, 1979

Subject: Screwworm Special Study Group.

To: P. A. Chaloux
Deputy Administrator, VS, APHIS

The Screwworm Special Study Group (Drs. Bushland, Knippling and Lindquist) plus Dr. Leo LaChance, met in Mission, Texas on February 20 to 23, 1979. Listed below are the comments resulting from this meeting.

The screwworm eradication program appears to have a reasonable chance of excellent success during 1979. There is evidence that there are few, if any, wild screwworm flies north of a line 75 to 100 miles south of the Mexican/U. S. border. This should permit immediate adjustments in distribution of flies to areas where they are needed to prevent native fly buildup and spread. The program in Baja, California appears to be going well. Although there is concern that the screwworm fly will spread northward from Sonora into Arizona, New Mexico and western Texas in 1979 as in 1978, it appears that there is a reasonable chance that this northward movement can be stopped if available flies are used in an optimum manner. The problem in Aldama and surrounding areas along the east coastal area is of concern, however again there is optimism that this problem can be solved with the Aricruz strain. The changes made in the last two months in the handling of the Pupae/flyes transported from Tuxtla Gutierrez have undoubtedly helped, however there is more improvement to be made. The slowness with which the new Aricruz strain is becoming laboratory adapted and increased to high numbers is of major concern, however changes which we suggested should greatly increase the numbers of flies available from this new strain.

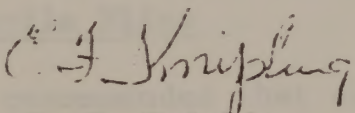
Two other broad areas of the program which should be improved as rapidly as possible in order that the overall effectiveness of the program may be improved are improved effectiveness of released sterile flies and surveillance.

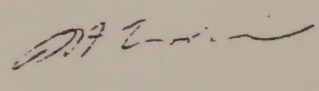
The Study Group stresses improvement in the effectiveness (quality) of released sterile screwworm flies. Included in effectiveness are genetics, strains, rearing, sterilization, handling, transport and release. Improved quality may result in fewer insects reared and released, however the program will be more effective. Some ways in which improved effectiveness of the released flies might be accomplished are recommended.

Improved surveillance will result from utilizing the swormlure baited wind directional trap for determining the presence or absence of wild screwworm flies. The use of this trap plus case reporting are essential to the more efficient and economical use of the released sterile screwworm flies.

Attached is a list of specific short-term actions which the Study Group recommends that APHIS implement. Many of these are under consideration or are being implemented by your program staff but are reemphasized in our recommendations. We believe that these recommendations, if implemented, will improve the screwworm eradication program within the immediate future. The Committee will soon offer additional recommendations for your consideration, particularly in regard to utilizing additional fly strains for use in various ecological areas where the native flies may not respond to the single strain that is produced, and offer other recommendations relating to genetics and nutrition.


D. A. Lindquist
Staff Scientist
Livestock and Veterinary
Sciences


E. F. Knipling
Consultant


R. C. Bushland
Consultant
(Concurred in fully
by telephone
conference.)

Attachment

cc:N. L. Meyer
J. Miller
H. G. Purchase
T. B. Kinney

February 28, 1979

Recommendations by the Screwworm Study Group^{a/} - Short-Term

Highest priority program adjustments necessary to take advantage of the current restricted screwworm survival areas.

I. Aricruz Strain

- A. Increase immediately the number of Aricruz eggling cages to the absolute maximum at Mission. It is recommended that eggling cages be placed in any suitable space including temporary eggling rooms on the factory floor if necessary. The objective is to increase as rapidly as possible the number of Aricruz flies which can be sterilized and released in critical infested areas and potential areas of northward spread, so as to prevent reinvasion into areas that now appear to be free of screwworms.
- B. Immediately initiate rearing the Aricruz strain at Tuxtla Gutierrez. This strain can be initiated in the Methods Development rearing rooms within security at Tuxtla Gutierrez. It may be possible to utilize the Methods Development rooms for eggling rooms and utilize the factory floor for larval development. Complete separation of the Aricruz and 009 strains is not necessary in the Tuxtla plant at present since the Aricruz strain is pure at Mission and can be rapidly transferred to Tuxtla Gutierrez in required numbers for full production once the strain approaches normal production at Mission.

II. Transport and Release of Sterile Flies

- A. Transport. It is recommended that all sterile pupae from Tuxtla Gutierrez be transported by air on a daily basis to all three distribution centers. This will prevent the need for chilling at Tuxtla Gutierrez, and avoid build-up of huge numbers of flies at the distribution centers which now take several days to handle, and will permit daily releases of flies from the distribution center when weather conditions permit, with the resulting improved quality. When chilling is necessary because of weather, the distribution centers should diligently follow the last-in/first-out method of handling sterile flies so that during times of inclement weather, all flies do not deteriorate in storage.

^{a/} R. C. Bushland, E. F. Knipling, D. A. Lindquist

- B. The goal in delivery and release of sterile flies from Tuxtla Gutierrez should be to deliver and release all flies within 72 hours after pupal radiation. If this is not feasible, then all flies received at the distribution centers should be released within 48 hours. To achieve these goals pupae must not be radiated at a younger age than is the current practice; if anything, radiation should be delayed as much as possible in order to improve fly quality.

III. Optimum Utilization of Sterile Flies Produced

- A. Release of 009 strain. It appears to the Study Group that from 20 to 35 million flies currently being released in Baja, California and additional millions of flies currently being released in Arizona and Texas could and should be more effectively utilized further south in Sonora and Veracruz where infestations currently exist and where the probability of northward spread is high. Since the termination or reduction in release of flies involves a certain element of risk that undetected infestations occur, the shift of these flies should be coupled with increased surveillance in Baja, California, in the U. S. and Northern Mexico where releases may be discontinued or greatly reduced. In all cases small boxes and 2-mile swath widths should be utilized.
- B. Release of Aricruz strain. The need to release the Aricruz flies in Arizona and Texas at this time is questionable, because there is currently no evidence that the screwworm is present in these areas. The primary potential problem is in Aldama and Sonora where current cases are reported. Therefore, we recommend that all Aricruz flies be released in these areas and in immediate areas of potential northward spread. The 009 flies can be used in the U. S. where screwworms appear to be absent at the present time. However, increased surveillance should be initiated in order to detect possible over-wintered infestations or long range dispersal of native flies from known infested areas.
- C. Surveillance - Trapping. It is recommended that a rapid increase in use of the wind oriented trap be initiated as soon as possible. Specifically, the planned use of up to 100 traps in Baja, California should be initiated promptly. In addition, the five major river valleys in Sonora which run north and south and are probably the major routes the screwworm follows

from Sonora into Arizona should be monitored with traps in addition to screwworm case surveillance. It is suggested that 20 traps per valley be utilized. Finally, it would be extremely useful for a trap survey to be conducted between Aldama and the Mexican/U. S. border on the east coast of Mexico in order to more rapidly detect and promptly intensify efforts to stop build-up of the wild screwworm flies from the Aldama area. All trap and case reporting data probably should be summarized at the distribution centers.

IV. Strengthen Methods Development.

It appears to the Study Group that Methods Development activities should be greatly increased. Examples of Methods Development work which is not being adequately conducted at the present time include new strain development and testing, improved trap design, rapid improvements in SWASS formulations and evaluations, improvements in larval rearing, developing computer technology for handling case reports, survey data, and release schedules, etc. In order to carry out urgent work of the nature listed the professional staff must be strengthened with both U. S. and Mexican entomologists.

V. Facilities for Separate Strains.

Necessary facilities should be constructed as soon as possible for maintenance of up to 3 complete separate strains (brood strains) of screwworm flies for release in different areas alone or in combination. This is a very high priority program goal. Facilities for multi-strain rearing have been urged since before the planning was completed for the Tuxtla Gutierrez facility.

VI. SWASS.

SWASS should continue to receive high priority from both research-and methods development personnel. If approved by Mexico EPA, it should be used in the Aldama and Ocampo area if needed during the next few weeks. In addition, a reasonably isolated 500 to 1,000 square mile area with a moderate to high screwworm population should be selected for a practical test in Mexico in order to determine its effectiveness under Mexican conditions when used alone. The use of SWASS should be demonstrated to the Mexican officials, including the Mexican EPA.

VII. The Aldama Situation.

The Aldama situation was discussed in considerable detail. Our recommendation is to immediately initiate releases of the Aricruz strain in Aldama and continue for 3 to 4 weeks. These sterile flies should be released from Mission in as excellent condition as possible; chilling of pupae or flies should be avoided if possible. The Ocampo area should be treated with the 009 strain as is being done at the present time, but the new strain should replace the 009 strain as soon as practicable in this area if it improves sterility in the Aldama area. If there is no increase in sterility, based on egg hatch, within 3 to 4 weeks in Aldama, then SWASS must be used to supplement the sterile fly releases in this area, and if successful, should also be used in the Ocampo area.

VIII. Aldama Strain.

The development of a broad genetic base Aldama strain as soon as possible is recommended. A strain from this area may be necessary to suppress screwworms in currently infested areas and prevent spread of the Aldama wild flies northward into the U. S.

The following four recommendations are high priority, but not as imperative as the preceding eight recommendations.

I. Strain Development.

A continuing new strain development program should be initiated as soon as possible. One professional with adequate facilities should undertake to establish 3 to 6 laboratory strains collected from various ecological areas of Mexico and particularly from areas where response to current fly releases seems inadequate. The selection of the ecological areas should be mutually agreeable among personnel in research, methods development, and program. These colonies should be maintained at approximately 10,000 adults at all times so that rapid introduction into the rearing factory can take place after about two generations of increase. Furthermore promising strains must undergo some laboratory and field evaluation before a decision is made to replace an existing strain or strains with a new strain.

II. Handling and Transport.

The handling and transport of pupae following radiation is one of the major causes of poor quality insects in the field. A detailed analysis of where the major problems exist and corrective action is necessary. It is encouraging to note that APHIS has assigned one Methods Development individual to work full-time on this problem under the direction of Dr. Snow. We recommend that a complete analysis of problems in handling and transport be completed as soon as possible, with emphasis on determining the benefits of minimal

chilling, vibration, and the most favorable conditions for adult eclosion. Field release/capture tests will be required for this study.

III. Larval Size.

It is recommended that Methods Development in Mission compare by field release/capture tests the longevity, dispersal, and levels of sterility produced by flies resulting from 65 to 75 milligram larvae. Discussion suggests that the latter size can probably be produced routinely by rearing fewer numbers per vat and by more frequent feeding.

IV. Entomological Expertise at Distribution Centers.

It would be extremely valuable if there were an entomologist, with prior experience in rearing and handling of insects, located at each of the distribution centers to help with entomological problems, identify sterile flies, assist in evaluating surveillance, assist in solving entomological problems with handling pupae, etc.

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

EAT 38
WFS 471

AGRICULTURAL RESEARCH
NATIONAL PROGRAM STAFF
BELTSVILLE, MARYLAND 20705

November 6, 1979

SUBJECT: Report from APHIS Screwworm Advisory Committee

TO: Norvan Meyer
APHIS

Attached is a copy of the report of the meeting held in Mission,
Texas on September 6-7, 1979.

AM 2

D. A. LINDQUIST
Staff Scientist
Insects Affecting Man
and Animals

Enclosure

cc:

F. Smith
J. W. Snow
H. G. Purchase
C. W. Carlson
T. B. Kinney
E. L. Kendrick
✓ E. A. Taylor
E. F. Knipling
R. C. Bushland

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AREA OFFICE
WESLACO, TEXAS

REPORT ON SCREWORM MEETING
(Bushland, Knipling, and Lindquist)

I. Introduction

The meeting was held the afternoon of September 6 and the morning of September 7, 1979, at Mission, Texas, with AR and APHIS personnel. The objective was to thoroughly review the available information on the various screwworm strains and recommend changes in screwworm strains at the Mission and Tuxtla Gutierrez mass production facilities, if this seemed advantageous or necessary.

II. Current Situation and Strain

The Aricruz strain has been in factory production for 8-9 months. This strain has done an excellent job during 1979 as measured by case reports in both the United States and Mexico. Furthermore, the Aricruz strain, when coupled with intensive surveillance and treatment of cattle in the Aldama area, has resulted in a dramatic reduction in cases and a concurrent increase in sterility in the wild screwworm population in the same area.

In Sonora the number of cases in 1979 have been much less than in 1978. It is difficult to credit all of the improved situation in Sonora with the Aricruz strain; however, the general feeling among the people at the meeting was that Aricruz did contribute a major part of the improvement. Other factors which would improve the situation in Sonora include a reduction in the swath width from 4 to 2 miles, improved shipping methodology of the pupae, improved overall handling of the pupae and flies, and fewer cattle being shipped from south Mexico into Sonora. Two factors would tend to worsen the screwworm situation in Sonora during 1979 as compared with 1978. They were the good screwworm weather in 1979, and the increased number of cattle in Sonora in 1979 when compared to 1978. More inspectors were operating in Sonora in 1979 than in 1978, which would result in reports on a higher proportion of the cases that did occur, which represents further evidence of more effective screwworm suppression in 1979 than in 1978.

There is no indication that the Aricruz strain is decaying. However, in view of the rapid decline in effectiveness of the 009 strain after it had been in production for about one year, the possibility of a similar rapid decline in the Aricruz strain was a major factor in the recommendations that were made.

The use of SWASS in the United States greatly helped the screwworm situation in 1979 and offers prospects for improving the program in Mexico, if use is authorized.

The APHIS managers have agreed to seriously consider rearing different strains at Mission and Tuxtla Gutierrez. If two strains are reared, Mission reared flies would be released primarily in eastern Mexico and in Texas while Tuxtla Gutierrez reared flies would be released primarily in western Mexico.

III. Strain for Mission, Texas

A new strain (DE-9) has been developed and is ready for placing into factory production. This strain was developed from 13 egg masses collected from wounded sheep in the Aldama area. Based on the following tests the DE-9 strain appears to be a satisfactory strain for program use: mating with flies from other areas, egg hatch, egg production, pupae production per vat, larval size, longevity, and field release recoveries. With regard to the latter, the lack of a sufficient number and type of field tests is regrettable. Every effort should be made to improve the field evaluation of a strain including egg mass sterility data before it is put into factory production in the future. A new agility test has been developed which indicates that the DE-9 strain is satisfactory. Thus available information indicates that the DE-9 strain will be satisfactory for factory production.

It was recommended by the group that the DE-9 strain replace the Aricruz strain in the Mission mass production facility in October 1979. Efforts should be made to evaluate DE-9 in western Mexico by releases followed by collection of egg mass sterility data.

IV. Strain for Tuxtla Gutierrez, Mexico

At the present time no strain originating from Sonora (western Mexico) is available to put into the Tuxtla Gutierrez facility. There is a strain under development which originated from 4 egg masses, all of the long X type. This strain could be available by November or December if no serious problems develop. In addition, there are 9-10 strains from individual egg masses in the methods development facilities at Tuxtla; none of these are the long X type.

For operational reasons, the APHIS managers of the screwworm program wish to avoid a change in strains except in October. It is not possible to put a Sonoran strain of any type into the Tuxtla facility during 1979.

The merits of a narrow genetic based strain such as the long X type versus a broader genetic based strain were discussed at some length. There was almost unanimous agreement by individuals present that a very narrow based genetic strain should not be used without prior supporting field and laboratory data indicating that such strain would be as good as the mixed chromosome strains used in the past. Complete reliance on a narrow genetic strain poses considerable risk that such strain would not perform well against possible diversified native strains. This

would not rule out future use of one or more narrow genetic strains in specific areas in Mexico, if adequate data are obtained on the performance of such strains.

Thus, the options available for a strain in the Tuxtla Gutierrez factory were as follows: A) leave the Aricruz strain in the Tuxtla facility, B) use the DE-9 strain in Tuxtla as well as Mission.

It was agreed to recommend that the Aricruz strain would remain in Tuxtla Gutierrez until either it showed signs of decay or until October 1980 at which time it will be replaced by a strain developed from western Mexico flies. In the interim, the DE-9 strain will be evaluated in Sonora as rapidly as possible so that if the Aricruz strain does decay it can be replaced with the DE-9, providing that it is effective in Sonora. A new Sonoran strain will be developed utilizing the "old system." The performance of the Aricruz strain will be followed as closely as possible utilizing both laboratory and field evaluation in order to determine as accurately as possible if and when it does start to decay. If the DE-9 strain does not prove effective in Sonora, and the Aricruz strain starts to decay, then the best Sonoran strain available will be put into the Tuxtla Gutierrez facility, for release in western Mexico.

The Cooperative Agreement between the University of Texas and SEA/AR involves an evaluation in the Arriaga area of south Mexico to determine whether the development of a strain from a single chromosome type does in fact result in better flies than a strain developed by random collection of egg masses for use in developing a new strain.

V. Recommendations

The following recommendations are made for the consideration of the managers of the APHIS eradication program:

1. There is a serious need for improved methods of estimating sterility in wild populations where sterile flies are released. The use of wounded sheep (sheep pen method) is expensive and cumbersome. An alternative or supplementary method would be to collect egg masses from normally wounded cattle. This requires close collaboration between research and methods development personnel and the inspectors. There is an urgent need for more research to develop a wound attractant or some other effective attractant for mated female screwworm flies in order to obtain sterility data.

2. There needs to be a number of candidate strains available at all times. It is suggested that 2-3 strains be in the laboratory at all times in a condition to move directly into the mass rearing facilities. These candidate strains should be periodically replaced with new strains. Thus we recommend that one full-time professional be assigned the responsibility of strain development. Appropriate facilities and technicians must be made available for this program. This program should be the responsibility of Methods Development.

3. A standardized quality control procedure is badly needed. It was agreed that Dr. J. Wendell Snow would work with Methods Development and others in proposing such standardized quality control procedures. Included must be field tests to evaluate new strains before they are placed into factory production.

4. There needs to be an intensive effort to measure any decay in the Aricruz strain because it will remain in the Tuxtla Gutierrez facility for 1 more year. If evidence of severe deterioration is obtained, a strain change should be made as rapidly as possible.

5. There is a need for a method of identifying the source of an infestation. For example, if an infestation occurs in Beeville, Texas, it is important to know whether this infestation originated from Sonora, Aldama, or some other place in Mexico. At the present time, there are no techniques available for this type of source identification. We recommend that this technology be investigated.

6. There is a continuing need for more nutrition research in mass rearing of the screwworm. Of considerable importance is to increase the size of the larvae and to determine whether there is a cumulative loss of essential nutrients carried over from one generation to another. The latter could be evaluated by rearing one or more generations of the factory fly on a live animal (rabbit or sheep) and comparing the progeny with the factory strain.

7. It is recommended that the DE-9 strain be evaluated in Ocampo in a manner very similar to the way the Aricruz was evaluated in Aldama. The presence of an apparently high wild fly population in Ocampo will continue to threaten Aldama with reinfestation and thus there is a need to not only test the DE-9 strain in Ocampo but to eliminate the fly in Ocampo in order to protect Aldama and other areas in northeastern Mexico and south Texas.

8. We recommend that the proposed Arriaga tests to evaluate the single chromosome type of strain development be initiated as soon as possible. Furthermore, it is recommended that this field experiment be designed jointly by AR, UT, and APHIS Methods Development personnel.

9. Recommendation V of our February 28, 1979, report, dealing with the need for facilities to rear separate strains, is reinforced.

